

Appl. No.: 09/963,360
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Off. Act. Dated: 08/17/2004

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-18 (canceled)

19. (currently amended): An apparatus for producing dried foods, comprising:
a housing having a drying chamber;
a particulate support substrate configured to separate pieces of food product;
means for introducing ultrasonic waves into said drying chamber; and
means for circulating a heated gas around said substrate and pieces of food product.

20. (canceled)

21. (currently amended): An apparatus as recited in claim ~~20~~ 19, wherein said means for circulating a heated gas around said food product and said means for ~~exposing said food product to~~ introducing said ultrasonic waves are configured to simultaneously expose said food product within said drying chamber to said ultrasonic waves and said heated gas.

22. (currently amended): An apparatus as recited in claim ~~20~~ 19, wherein said means for ~~exposing said food product to~~ means for introducing ultrasonic waves is configured for ~~exposure~~ introducing waves at wavelengths within the range of approximately 20 KHz to approximately 100 KHz for approximately fifteen to ninety minutes.

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23. (canceled)

24. (previously presented): An apparatus as recited in claim 19, wherein said circulated heated gas comprises nitrogen gas introduced to said drying chamber from a source of nitrogen gas.

25. (currently amended): An apparatus for producing dried foods, comprising:
a housing having a drying chamber;
a particulate support substrate configured to separate and support pieces of a food product;
means for exposing said pieces of a food product to ultrasonic waves; and
means for circulating a heated gas around said food product until the moisture content of said food product decreases[.][.]] ;
wherein said pieces of said food product are not compressed.

26. (original): An apparatus as recited in claim 25, wherein said means for circulating a heated gas around said food product and said means for exposing said food product to ultrasonic waves are configured to simultaneously expose said food product to said ultrasonic waves and said heated gas.

27. (original): An apparatus as recited in claim 25, wherein said means for exposing said food product to ultrasonic waves is configured for exposure at wavelengths within the range of approximately 20 KHz to approximately 100 KHz for approximately fifteen to ninety minutes.

28. (canceled)

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29. (previously presented): An apparatus as recited in claim 25, wherein said circulated heated gas comprises nitrogen gas introduced into said chamber from a source of nitrogen gas.

30. (currently amended): An apparatus for reducing the moisture content in a food product, comprising:

- a housing;
- said housing having a first drying zone and a second drying zone;
- a particulate support substrate configured to separate and support pieces of a food product;
- a conveyor;
- said conveyor configured to move said substrate and said pieces of food product through said first and second drying zones;
- a first heat source;
- said first heat source configured to circulate heated gas through said first drying zone at a first temperature; and
- a second heat source;
- said second heat source configured to circulate heated gas through said second drying zone at a second temperature.

31. (currently amended): An apparatus ~~as recited in claim 30, further comprising:~~ for reducing the moisture content in a food product, comprising:

- a housing;
- said housing having a first drying zone and a second drying zone;
- a support substrate configured to separate and support pieces of a food product;
- a conveyor;
- said conveyor configured to move said substrate and said pieces of food product through said first and second drying zones;

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a first heat source;
said first heat source configured to circulate heated gas through said first drying zone at a first temperature;
a second heat source;
said second heat source configured to circulate heated gas through said second drying zone at a second temperature; and
an ultrasound source;
said ultrasound source configured to expose said food product in at least one of said drying zones to ultrasonic waves without compressing said food product.

32. (currently amended): An apparatus as recited in claim ~~30~~ 31:
wherein said first heat source is configured to circulate said gas through said housing at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot; and

wherein said second heat source are configured to circulate said gas through said housing at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

33. (currently amended): An apparatus as recited in claim ~~30~~ 31:
wherein said first heat source is configured to circulate gas through said first drying zone at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot; and

wherein said second heat source is configured to circulate gas through said second drying zone at a rate of rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

34. (canceled)

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35. (currently amended): An apparatus as recited in claim ~~30~~, 31, wherein said support substrate comprises a plurality of spheres.

36. (currently amended): An apparatus as recited in claim ~~30~~ 35, wherein said conveyor includes a plurality of vanes having an intermediate area containing said spheres.

37. (original): An apparatus as recited in claim 35, wherein said spheres are held in a container placed on said conveyor.

38. (original): An apparatus as recited in claim 31, wherein said ultrasonic source and at least one said heat source are configured to simultaneously expose said food product to said ultrasonic waves and said heated gas.

39. (original): An apparatus as recited in claim 38, wherein said ultrasonic source is configured for exposure at wavelengths within the range of approximately 20 KHz to approximately 100 KHz for approximately fifteen to ninety minutes.

40. (currently amended): An apparatus for reducing the moisture content in a food product, comprising:

a housing;

said housing having a first drying zone and a second drying zone;

a particulate support substrate configured to separate and support pieces of a food product;

a conveyor;

said conveyor configured to move said support substrate and said food product through said first and second drying zones;

a first heat source;

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said first heat source configured to circulate heated gas through said first drying zone at a first temperature;

a second heat source;

said second heat source configured to circulate heated gas through said second drying zone at a second temperature; and

an ultrasound source;

said ultrasound source configured to expose said food product in at least one of said drying zones to ultrasonic waves.

41. (original) An apparatus as recited in claim 40:

wherein said first heat source is configured to circulate said gas through said housing at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot; and

wherein said second heat source are configured to circulate said gas through said housing at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

42. (original) An apparatus as recited in claim 40:

wherein said first heat source is configured to circulate gas through said first drying zone at a rate of rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot; and

wherein said second heat source circulates gas through said second drying zone at a rate of rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

43. (canceled)

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44. (currently amended): An apparatus as recited in claim [[,]] 40₁ wherein said support substrate comprises a plurality of spheres.

45. (original): An apparatus as recited in claim 44, wherein said conveyor includes a plurality of vanes having an intermediate area containing said spheres.

46. (original): An apparatus as recited in claim 44, wherein said spheres are held in a container placed on said conveyor.

47. (original): An apparatus as recited in claim 40, wherein said ultrasonic source and at least one said heat source are configured to simultaneously expose said food product to said ultrasonic waves and said heated gas.

48. (original): An apparatus as recited in claim 47, wherein said ultrasonic source is configured for exposure at wavelengths within the range of approximately 20 KHz to approximately 100 KHz for approximately fifteen to ninety minutes.

49. (currently amended): An apparatus for reducing the moisture content in a food product, comprising:

a housing;

said housing having first, second and third drying zones;

a particulate support substrate configured to separate and support pieces of a food product;

a conveyor;

said conveyor configured to move said substrate and said pieces of food product through said drying zones;

a first heat source;

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said first heat source configured to circulate heated gas through said first drying zone at a first temperature;
a second heat source;
said second heat source configured to circulate heated gas through said second drying zone at a second temperature;
a third heat source;
said third heat source configured to circulate heated gas through said third drying zone at a third temperature; and
an ultrasound source;
said ultrasound source configured to expose said food product in at least one of said drying zones to ultrasonic waves.

50. (original): An apparatus as recited in claim 49:

wherein said first, second and third heat sources are configured to circulate said gas through said housing at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

51. (original): An apparatus as recited in claim 49:

wherein said first heat source is configured to circulate gas through said first drying zone at a rate of rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot;

wherein said second heat source is configured to circulate gas through said second drying zone at a rate of rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute square foot; and

wherein said third heat source is configured to circulate gas through said third drying zone at a rate of rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

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52. (canceled)

53. (previously presented): An apparatus as recited in claim 49, wherein said support substrate comprises a plurality of spheres.

54. (previously presented): An apparatus as recited in claim 49, wherein said conveyor includes a plurality of vanes having an intermediate area containing said substrate.

55. (currently amended): An apparatus as recited in claim ~~49~~ 53, wherein said spheres are held in a container placed on said conveyor.

56. (original): An apparatus as recited in claim 49, wherein said ultrasonic source and at least one said heat source are configured to simultaneously expose said food product to said ultrasonic waves and said heated gas.

57. (original): An apparatus as recited in claim 56, wherein said ultrasonic source is configured for exposure at wavelengths within the range of approximately 20 KHz to approximately 100 KHz for approximately fifteen to ninety minutes.

58. (previously presented): An apparatus for reducing the moisture content in material, comprising:

- a housing;
- said housing having at least one drying chamber;
- a support substrate configured to separate and support pieces of a material;
- means for exposing said material to sound waves having a first ultrasonic wavelength for a first period of time and simultaneously circulating a heated gas at a first temperature around said material for said first period of time;

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means for exposing said food material to sound waves having a second ultrasonic wavelength for a second period of time and simultaneously circulating a heated gas at a second temperature around said material for said second period of time;

means for exposing said food material to sound waves having a third ultrasonic wavelength for said third period of time and simultaneously circulating a heated gas at a third temperature around said material for third period of time; and

means for separating said material from said substrate.

59. (currently amended): An apparatus for desiccating a food product, comprising:

an ultrasound source;

said ultrasound source configured to subject a food product to ultrasonic waves without touching said food product;

a first source of air heated to a temperature of approximately 190° F to approximately 210° F and configured to circulate heated air around the food product for approximately fifteen minutes;

a second source of air heated to a temperature of approximately 170° F to approximately 190° F and configured to circulate heated air around the food product for approximately fifteen minutes; and

a third source of air heated to a temperature of approximately 150° F to approximately 170° F and configured to circulate heated air around [[the]] the food product for approximately one hour.

60. (previously presented): An apparatus as recited in claim 59, wherein said first, second and third sources of heated air are configured to send heated air through said housing at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

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61. (previously presented): An apparatus as recited in claim 59:

wherein said first source of air is configured to circulate heated air at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot; and

wherein said second source of air is configured to circulate heated air a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot; and

wherein said third source of air is configured to circulate heated air at a rate of between approximately 150 cubic feet per minute per square foot and approximately 450 cubic feet per minute per square foot.

62. (currently amended): An apparatus for the desiccation of a generally particulate material, comprising:

a housing having a plurality of drying zones;

a particulate support substrate disposed within said housing configured to separate pieces of particulate material;

means for circulating gas at variable rates through each of said drying zones;
and

means for exposing said support substrate and said material to each of said drying zones and circulating gas for a period of time.

63. (previously presented): An apparatus as recited in claim 62, wherein said support substrate comprises a plurality of spheres.

64. (previously presented): An apparatus as recited in claim 62, wherein said means for exposing said substrate to said drying zones comprises a conveyor.

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65. (previously presented): An apparatus as recited in claim 64, wherein said conveyor further comprises:

a plurality of vanes having an intermediate area configured to contain said substrate.

66. (previously presented): An apparatus as recited in claim 64, further comprising means for exposing said particulate material to ultrasonic waves.

67. (previously presented): An apparatus as recited in claim 64, wherein said ultrasonic source is configured for exposure at wavelengths within the range of approximately 20 KHz to approximately 100 KHz for approximately fifteen to ninety minutes.

68. (previously presented): An apparatus as recited in claim 64, wherein said means for circulating a gas comprise:

at least one blower; and

at least one heat source associated with said blower configured to circulate heated gas through said drying zones.